इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“पुराने को छोड नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

IS 14414 (1996): Agricultural tractors - Axle power determination - Test procedures [FAD 11: Agricultural Tractors and Power Tillers]

“ज्ञान से एक नये भारत का निर्माण”
Satyanarayan Gangaram Pitroda
“Invent a New India Using Knowledge”

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”
Bhartṛhari—Nītiśatakam
“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

IS 14414 : 1996

(Reaffirmed 2012)

भारतीय मानक

कृषि ट्रैक्टर — धुरी शक्ति निर्धारण — परीक्षण प्रक्रिया

Indian Standard

AGRICULTURAL TRACTORS — AXLE POWER DETERMINATION-TEST PROCEDURES

ICS 65.060.10

©BIS 19%

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

December 1996

Price Group 3

Agricultural Tractors and Power Tilllers Sectional Committee, FAD 32

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Agricultural Tractors and Power Tillers Sectional Committee had been approved by the Food and Agriculture Division Council.

Earlier tractors were tested at the drawbar and PTO for power declaration. It is now an international practice to declare the axle power of the tractors also. In order to have a unifrorm practice for testing axle power a need was felt to formulate a standard on the subject.

Though high ambient temperature test has not been covered in ISO, keeping in view the prevalent situation in the country an optional high ambient temperature test has been included in this standard.

In the preparation of this standard, considerable assistance has been derived from IS0 789-7 : 199 1 ‘Agricultural tractors — Test procedure -Part 7 : Axle power determination’, issued by the International Organization for Standardization

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values *(revised)* ’.

Indian Standard

AGRICULTURAL TRACTORS - AXLE POWER DETERMINATION — TEST PROCEDURES

1 SCOPE

This Indian Standard specifies test procedures for determining the power available at the axle or axles of wheeled or track-laying agricultural tractors having one or two driven axles.

2 NORMATIVE REFERENCES

The following Indian Standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
5994 : *1987*	Test code for agricultural tractors (*second revision*)
10274 : *1993*	Agricultural wheeled tractors — Maximum travel speed — Method of determination (*first revision*)
12226 : *1995*	Agricultural tractors — Power test for drawbar -Test procedure *(first revision)*

3 DEFINITIONS

For the purpose of this standard, the following definitions shall apply.

3.1 Rated Engine Speed

Engine speed specified by the tractor manufacturer for continuous operation at full load.

3.2 Axle Power

Sum of the powers measured at all powered axles.

3.3 Maximum Permissible Torque

Maximum torque specified by the manufacturer for the purposes of this test.

3.4 Specific Fuel Consumption

Mass of fuel consumed per unit of work.

4 MEASUREMENT UNITS AND TOLERANCES

The following units and tolerances are used in this standard in addition to those given in *4* of IS 5994 *1987:*

Fuel consumption.
in kilograms
per kilowatt hour ± 1 percent.

5 GENERAL REQUIREMENTS

5.1 Specification

The tractor tested shall conform to the specification in the test report (see Annex A) and shall be used in accordance with the manufacturer's recommendations for normal operation.

5.2 Running-In and Preliminary Adjustments

The tractor shall be run-in prior to the test. For spark-ignition engines fitted with a means for the operators to vary the ratio of the fuel/air mixture, the tests shall be carried out with the settings recommended for normal operation. The adjustment of the carburettor or the injection pump shall conform to the manufacturer's specification. Run-in shall be done with the governor set at full throttle and with the engine operating at rated speed.

5.3 Fuels and Lubricants

Fuels and lubricants for the test shall conform to 5.3 of IS 12226 : 1995.

5.4 Ancillary Equipment

For all tests, accessories such as the hydraulic lift pump or air compressor may only be disconnected if it is practicable for the operator to do so as normal practice in work, in accordance with the operator's manual and without using tools. If not, they shall remain connected and operate at minimum load.

If the tractor is equipped with devices that create variable parasitic power losses such as a variable speed cooling fan, intermittent hydraulic or electrical demands, etc, the device shall not be disconnected or altered for test purposes. If it is practical for the operator to disconnect the device as outlined by the operator's manual. it may be disconnected for test purposes; this shall be recorded in the test report.

Power variations during tests caused by these devices exceeding ± 5 percent shall be recorded in the test report in terms of percent variation from the mean.

5.5 Operating Conditions

Make no corrections to the measured values of torque or power for atmospheric conditions or other factors. Atmospheric pressure shall not be less than 96.6 kPa. If this is not possible because of conditions of altitude, a modified carburettor or fuel pump setting may have to be used. details of which shall be included in the report.

The surrounding temperature shall be 27°C ± 7°C.

Stable operating conditions shall have been attained at each load setting before beginning test measurement.

5.6 Fuel Consumption

Arrange the fuel measurement apparatus so that the fuel pressure at the carburettor or the fuel injection pump is equivalent to that which exists when the tractor fuel tank is half-full. The fuel temperature shall be comparable to that occurring during full load operation for 2 h of the tractor when fuel is taken from the tractor fuel tank.

When consumption is measured by volume, calculate the mass of fuel per unit of work using the density corresponding to the appropriate fuel temperature. This figure shall then be used to calculate the volumetric data using the fuel density at 15°C.

Alternatively, when the consumption is measured by mass, calculate volumetric data using the fuel density (specific gravity) value at 15°C.

6 TEST PROCEDURE

6.1 General

All the driven axles of the tractor shall be coupled to the dynamometers. All measurements shall be made with the engine governor control set for maximum engine speed.

The various tests shall normally be carried out continuously.

The angularity of any shaft connecting the driving axles to the dynamometers shall not exceed 2°.

If an exhaust gas discharge device for the test is used, it shall not change the engine performance.

6.2 Choice of Transmission Ratios

Measurements shall be made in transmission ratios including and between that giving the slowest forward speed and that giving the fastest forward speed recommended by the manufacturer for field work, at between 3 km/h and 16 km/h. A minimum of six transmission ratios shall-be used, their choice as far as possible allowing the efficiency of the various ratio-changing devices to be assessed.

If the tractor has a hydrokinetic torque converter which can be locked out by the driver, carry out the test both with the torque converter in operation and with it locked out.

If the tractor has a stepless variation transmission, carry out the test at six transmission ratio approximately equally spaced.

Tractors with two drive axles shall be tested with both axles engaged.

6.3 Control of Speeds and Torques

The torques applied and the rotational speeds of the two wheels of the same axle shall be equal. In the case of an axle which cannot be tested with the differential locked, the torques applied to each of the two wheels shall be controlled so that the deviation of the rotational speeds of the two wheels is less than 5 percent.

In the case of tractors with two driven axles with a differential between them which cannot be locked, the torques applied to each of the two axles shall be controlled so that the deviation between the mean peripheral speeds of the front and rear wheels is less than 5 percent. The dynamic radius indices of the tyres as given in Annex A of IS 10274 : 1993 shall be used for this determination.

In the case of tractors with two drive axles without a differential between them, power at the axles shall be measured with several distributions of power between them. For each transmission ratio selected, increase the torque on the axle for which the manufacturer indicates the higher permissible torque until the rated engine speed or the maximum torque permissible for the axle is reached. If the rated speed of the engine has not been reached, increase the torque on the second axle until the rated engine speed or the -maximum torque permissible for this axle is reached. If the rated speed of the engine has still not been reached, the measurement shall be terminated for that transmission ratio.

If the rated speed of the engine is reached, the measurement shall be repeated as many times as necessary to obtain the maximum torque permissible at the second axle by reducing the torque applied to the first axle each time by 20 percent of the value applied to that axle in the first measurement. If the maximum torque permissible for the second axle is reached, increase the torque on the first axle to attain rated engine speed.

For each measurement, record the rotational speed of each wheel, the torque applied to each wheel, the rotational speed of the engine and the fuel consumption. Also, calculate the axle power.

6.4 **Additional Measurements**

In addition to the performance measurements specified above, report the following:

a) Ambient air temperature at a representative point approximately 2 m in front of the tractor and approximately 1.5 m above the ground (where the tractor is fitted with a forward blowing pusher fan, ambient air temperature measurements shall be made at appropriate alternative positions);

b) Air temperature at the engine air intake;

c) Atmospheric pressure;

d) Relative air humidity;

e) Maximum coolant temperature (in case of an air-cooled engine, measure the temperature of the cylinder block at representative points);

f) The fuel temperature at the inlet to the carburettor or injection pump;

g) Engine oil temperature; and

h) Transmissionoil temperature.

6.5 Tests **at High Ambient Temperature (Optional)**

The tests given under 6.2 and 6.3 shall be conducted under high ambient temperature of 43°C ± 2°C. The observations given under 6.4 shall also be reported.

ANNEX A

(*Clause* 5.1)

SPECIMEN TEST REPORT

A-1 LOCATIONS

Tractor manufacturer's name and address ....

Place of running-in: ....

Duration of running-in: ....

A-2 SPECIFICATION OF TRACTOR

Tractor

Model .... Sl No. ....

Engine

Make .... Model ....

Type.. .... Sl No. ....

Rated speed .... **min^{-1}**

Cylinders

Number .... Bore .... ,**mm**

Stroke ....m m Capacity .... ,**l**

Fuel and Injection System

Capacity of fuel tank .... ,**l**

Make, type and model of injection pump ....

Manufacturer's production setting ...., l/h

Make, type and model of injectors ....

Make, type and model of magneto, coil and distributor ....

Make, type and model of carburettor ....

Injection or injection timing (manual or automatic) ....

Air Cleaner

Make and model .. Type ....

Precleaner (if fitted)

Make and model .... Type ....

Transmission

Clutch

Type .... Diameter of discs .... ,mm

Nominal Travel Speeds

Gear
Rear Wheels
Tyre size
Dynamic radius index
Axle, r/min*
Nominal travel speed, km/h*
Front wheels (if powered)
Tyre size
Dynamic radius index
Axle, r/min*
Nominal travel speed, km/h*

Steering

Type ....

(for example. manual, power or power-assisted)

Wheels

Location of steered wheels ....

Front

Make of tyres .... Type ....

(for example radial or cross-ply)

Size ....

Front axle powered (Yes/No) Ply rating........................

Dynamic radius index .... ,mm

Rear

Make of tyres .... Type ....

(for example radial or cross-ply)

Size ....

Ply rating ....

---

*At rated engine speed.

Wheelbase ...., mm

Track

Type .... **Number** of track plates ....

Width of track plates .... .mm

Masses (With tanks **full but without driver)**

Mass	Front	Rear	Total
Without ballast			
With ballast			

A-3 FUEL AND LUBRICANT SPECIFICATIONS

Fuel

Trade name .... Octane **(Ron)**[1] ....

Octane number or cetane No. .... **Density at 15°C** ....

Type ....

Engine oil

Trade name .... **Type** . ...

Viscosity class .... — ....

Transmission oil

Trade-Name .... Type . ...

Viscosity class ....

Maximum temperatures

Coolant .... °C

Engine oil .... °C

Fuel .... °C

Engine air intake .... °C

Transmission **oil** .... °C

---

[1] RON : Research Octane Number.

Table A.1 Table of Results

Date of Test:

Atmospheric Conditions

Temperature °C
Relative Humidity
Pressure kPa

Gear	Rear Axle					Front Axle					Total Power	Fuel Consumption	
	Left		Right		Power	Left		Right		Power		Specific	Hourly
	Torque Nm	Speed r/min	Torque N m	Speed r/min	kW	Torque Nm	Speed r/min	Torque Nm	Speed r/min	kW	kW	kg/kWh	l/h
....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....

NOTE — Repeat this table if measurements are made in more than six transmissions.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also-reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. FAD 32 (348).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 323 01 31,323 94 02, 323 83 75

Telegrams: Manaksanstha (Common to all offices)

Regional Offices:	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	323 76 17 323 3841
Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola CALCUTTA 700054	337 84 99, 337 85 61 337 86 26, 337 86 62
Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022	60 38 43 60 20 25
Southern : C. I. T. Campus, IV Cross Road, MADRAS 600113	235 02 16, 235 04 42 235 15 19, 235 23 15
Western : Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400093	832 92 95,832 78 58 832 78 91,832 78 92

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR.
COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD.
JAIPUR. KANPUR. LUCKNOW. BATNA. THIRUVANANTHAPURAM.

Printed at New India Printing Press, Khurja, India